AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A multi-channel matrix decoder module for generating a plurality of audio output signals from a plurality of audio input signals, the plurality of audio input signals being directed to different locations, the audio output signals for generating sound waves in an environment, the decoder module comprising:

an input mixer that produces a plurality of input signal pairs using the plurality of audio input signals, each of the plurality of the input signal pairs being non-inverses of one another and directed to the different locations in the environment, at least one of the input signal pairs being based on at least one of the audio input signals from a different location; and

a matrix decoder coupled to the input mixer, the matrix decoder comprising different sections directed to the different locations, each of the sections receiving input from one of the input signal pairs and outputting output signals for the location correlated to the input signal pair received.

2. (Previously Presented) A method for decoding a plurality of audio input signals into a plurality of audio output signals, the plurality of audio input signals being directed to different locations, the audio output signals for generating sound waves in an environment, the method comprising:

creating a plurality of input signal pairs as a function of the plurality of input signals, the input signal pairs being non-inverses of one another and for the different locations in the environment, at least one of the input signal pairs being based on at least one of the audio input signals from a different location; and

creating a plurality of output signals as a function of the plurality of input signal pairs using a matrix decoder, the matrix decoder comprising different sections directed to the different locations, each of the sections receiving input from one of the input signal pairs and outputting output signals for the location correlated to the input signal pair received.

3. (Canceled)

4. (Canceled)

5. (Previously Presented) The decoder module of claim 1, where the input mixer produces the input signal pairs from three or more audio input signals.

6. (Previously Presented) The decoder module of Claim 1, where at least one of the input signal pairs produced by the input mixer comprises a rear input signal pair, a side input signal pair, or a front input signal pair.

7. (Previously Presented) The decoder module of Claim 1, where at least one of the input signal pairs produced by the input mixer comprises a steering angle input signal pair.

8. (Previously Presented) The decoder module of Claim 7, where the plurality of audio input signals comprises a left-front, a right-front, a left-surround, a right-surround, and a center input signal, and producing the steering angle input pair comprises converting the left-front, the right-front, the left-surround, the right-surround, and the center input signals into the steering angle input pair.

9. (Previously Presented) The decoder module of Claim 1, where input to each of the sections for the different locations of the matrix decoder consists of the input signal pair received for the different locations and steering angle input.

10. (Previously Presented) The decoder module of Claim 1, where the sections of the matrix decoder comprises a plurality of submatrices, each submatrix receiving input from one of the plurality of input signal pairs.

11. (Previously Presented) The decoder module of Claim 10, where the input mixer produces a rear input signal pair; and

where one of the plurality of submatrices comprises a rear submatrix that inputs the rear input signal pair and produces a plurality of rear output signals as a function of the rear input signal pair.

12. (Previously Presented) The decoder module of Claim 11, where at least one of the signals in the rear input signal pair is produced by the input mixer according to an equation RI1=LFI + 0.9 x LSurI + 0.38 x RSurI+Gr x CTRI,

where Gr comprises a ratio with the center input signal to control the amount of the center input signal in the rear input signal pair,

LFI comprises a left-front input signal,

LSurI comprises a left-surround input signal,

RSurI comprises a right-surround input signal, and

CTRI comprises a center input signal.

13. (Previously Presented) The decoder module of Claim 1, where at least some of the plurality of audio input signals comprise the same locations as at least some of the plurality of audio output signals.

14. (Previously Presented) The decoder module of Claim 13, where the at least some of the plurality of audio input signals comprise a left-front input signal and a right-front input signal; and

where the at least some of the plurality of audio output signals comprise a left-front output signal and a right-front output signal.

15. (Previously Presented) The decoder module of Claim 13, where the at least some of the plurality of audio input signals comprises a center input signal; and

where the at least some of the plurality of audio output signals comprise a center output signal.

16. (Previously Presented) The method of claim 2, where the plurality of input signal pairs is created from three or more audio input signals.

17. (Previously Presented) The method of Claim 2, where at least one of the input signal pairs produced by the input mixer comprises a rear input signal pair, a side input signal pair, and a front input signal pair.

18. (Previously Presented) The method of Claim 2, where at least one of the input signal pairs produced by the input mixer comprises a steering angle input signal pair.

19. (Previously Presented) The method of Claim 18, where the plurality of audio input signals comprises a left-front, a right-front, a left-surround, a right-surround, and a center input signal, and

where creating the steering angle input pair comprises converting the left-front, the right-front, the left-surround, the right-surround, and the center input signals into the steering angle input pair.

20. (Previously Presented) The method of Claim 2, where input to each of the sections for the different locations of the matrix decoder consists of the input signal pair received for the different locations and steering angle input.

21. (Previously Presented) The method of Claim 2, where creating a plurality of output signals as a function of the plurality of input signal pairs using a matrix decoder comprises decoding using a plurality submatrices, each submatrix receiving input from one of the plurality of input signal pairs.

22. (Previously Presented) The method of Claim 21, where creating a plurality of input signal pairs comprises creating a rear input signal pair; and

where one of the plurality of submatrices comprises a rear submatrix that inputs the rear input signal pair and produces a plurality of rear output signals as a function of the rear input signal pair.

23. (Previously Presented) The method of Claim 22, where at least one of the signals in the rear input signal pair is produced according to an equation

RI1=LFI + 0.9 x LSurI + 0.38 x RSurI+Gr x CTRI,

where Gr comprises a ratio with the center input signal to control the amount of the center input signal in the rear input signal pair,

LFI comprises a left-front input signal,

LSurI comprises a left-surround input signal,

RSurI comprises a right-surround input signal, and

CTRI comprises a center input signal.

24. (Previously Presented) The method of Claim 2, further comprising producing an additional audio output signal as a function of one or more of the plurality of audio output signals.

25. (Previously Presented) The method of Claim 24, where the plurality of audio output signals comprises a side output signal; and

where producing an additional audio output signal comprises producing an additional side output signal.

26. (Previously Presented) The decoder module of Claim 2, where at least some of the plurality of audio input signals comprise the same locations as at least some of the plurality of audio output signals.

27. (Previously Presented) The decoder module of Claim 26, where the at least some of the plurality of audio input signals comprise a left-front input signal and a right-front input signal; and

where the at least some of the plurality of audio output signals comprise a left-front output signal and a right-front output signal.

28. (Previously Presented) The decoder module of Claim 26, where the at least some of the plurality of audio input signals comprises a center input signal; and

where the at least some of the plurality of audio output signals comprise a center output signal.

29.-32. (Canceled)

33. (Previously Presented) The decoder module of Claim 1, where the plurality of audio input signals comprise a left-front input signal, a right-front input signal, and at least one additional input signal; and

where the input mixer produces at least one input signal pair using each of the plurality of audio input signals.

34. (Previously Presented) The decoder module of Claim 33, where the input signal pair comprises a rear input signal pair; and

where the multi-channel matrix decoder module generates audio output signals for rear loudspeakers whenever there is any signal on any of the plurality of input signals.

35. (Previously Presented) The decoder module of claim 34, where the multi-channel matrix decoder module generates audio output signals for rear loudspeakers whenever there is any signal that is at most a predetermined frequency on any of the plurality of input signals.

36. (Previously Presented) The decoder module of Claim 1, where the input mixer produces at least one input signal pair using at least one adjacent input signal, the adjacent input signal being adjacent to at least one of the input signals corresponding to the input signal pair, the input mixer using the at least one adjacent input signal in order to provide smoother transition between output channels associated with the at least one adjacent input signal and associated with at least one input signal signals.

37. (Previously Presented) The decoder module of Claim 1, where the plurality of audio input signals comprises n signals, and

where the input mixer produces m input signal pairs, where m*2 is greater than n.

38. (Previously Presented) The decoder module of Claim 37, where the plurality of audio input signals comprise a left front input signal, a right front input signal, a center input signal, a left surround input signal, and a right surround input signal; and

where the input mixer produces a rear input pair, the surround input pair, and the front input pair from the plurality of audio input signals.

39. (Previously Presented) The decoder module of Claim 38, where the input mixer further produces a steering angle input pair.

40. (Previously Presented) The decoder module of Claim 1, where the plurality of audio input signals exclude any rear input signals; and

where the input mixer produces a rear input pair from the plurality of audio input signals.

41. (Previously Presented) A multi-channel matrix decoder module for generating a plurality of audio output signals from a plurality of audio input signals, the plurality of audio input signals being directed to different locations, the audio output signals for generating sound waves in an environment, the decoder module comprising:

an input mixer that produces at least one input signal pair using each of the plurality of audio input signals; and

a matrix decoder coupled to the input mixer, the matrix decoder comprising different sections directed to the different locations, each of the sections receiving input from one of the input signal pairs and outputting output signals for the location correlated to the input signal pair received.

42. (Previously Presented) The decoder module of Claim 41, where the input signal pair comprises a rear input signal pair.

43. (Previously Presented) The decoder module of Claim 42, where the multi-channel matrix decoder module generates audio output signals for rear loudspeakers whenever there is any signal on any of the plurality of input signals.